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Eucalyptus in Great Britain

Species choice, yields and financial returns

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Woody Crops: Growing a Bioeconomy
9th Biennial Short Rotation Woody Crops Operations Working Group
Conference, November 5-8, 2012, Oak Ridge, Tennessee

Contents



- Potential species
- Records of yields
- *Eucalyptus gunnii* growth curve
- Costs and revenues
- Economic analysis
- Risk



Potential species



Potential species



Figure 1: Comparison of latitude and area of Europe and Australia (adapted from Turnbull and Eldridge 1983). The natural distribution of *E. gunnii* (black) and *E. nitens* (grey) (Brooker and Kleinig 1990). (Leslie, Mencuccini and Perks 2011)

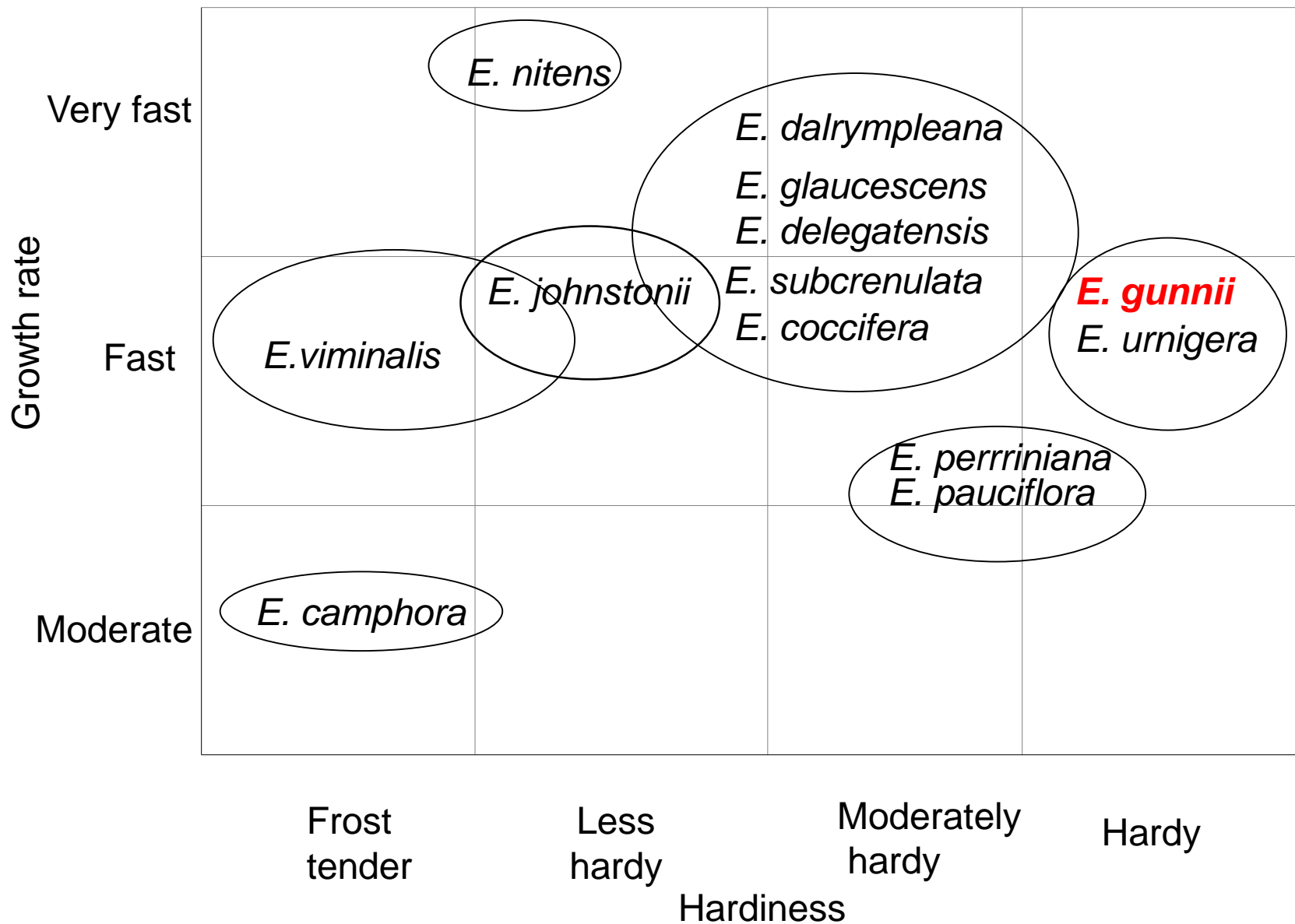


Figure 2: Growth and hardiness of eucalypts in Great Britain (Leslie, Mencuccini and Perks 2011)

Records of yields (mass)



Daneshill – Nottinghamshire
24.2ha of Eucalypts planted in
2005. *E gunnii* and *E nitens*.
Stems killed December 2010.



Woodchip harvested in June
2011 was 2076.4 tonnes or
85.83 tonnes / ha or 17.16
tonnes ha⁻¹ year⁻¹ (greenish)
(6.95 tonnes acre⁻¹ year⁻¹)
(Wooddisse 2011)



Records of yields (volumes)



Red Marley – Worcestershire - second rotation
coppice measured at 10 years old

Species	Height (m)	Dbh (cm)	Stools ha ⁻¹	Stems ha ⁻¹	Vol m ³ ha ⁻¹	Biomass odt ha ⁻¹
<i>E. gunnii</i>	17.19	13.2	2370	3792	248	193
<i>E. dalrympleana</i>	17.08	16.1	530	954	69	49
			2900	4746	317	242

Assuming a dry density ~700 kg m⁻³
(McKay 2010)

Or 31.7 m³
ha⁻¹ y⁻¹

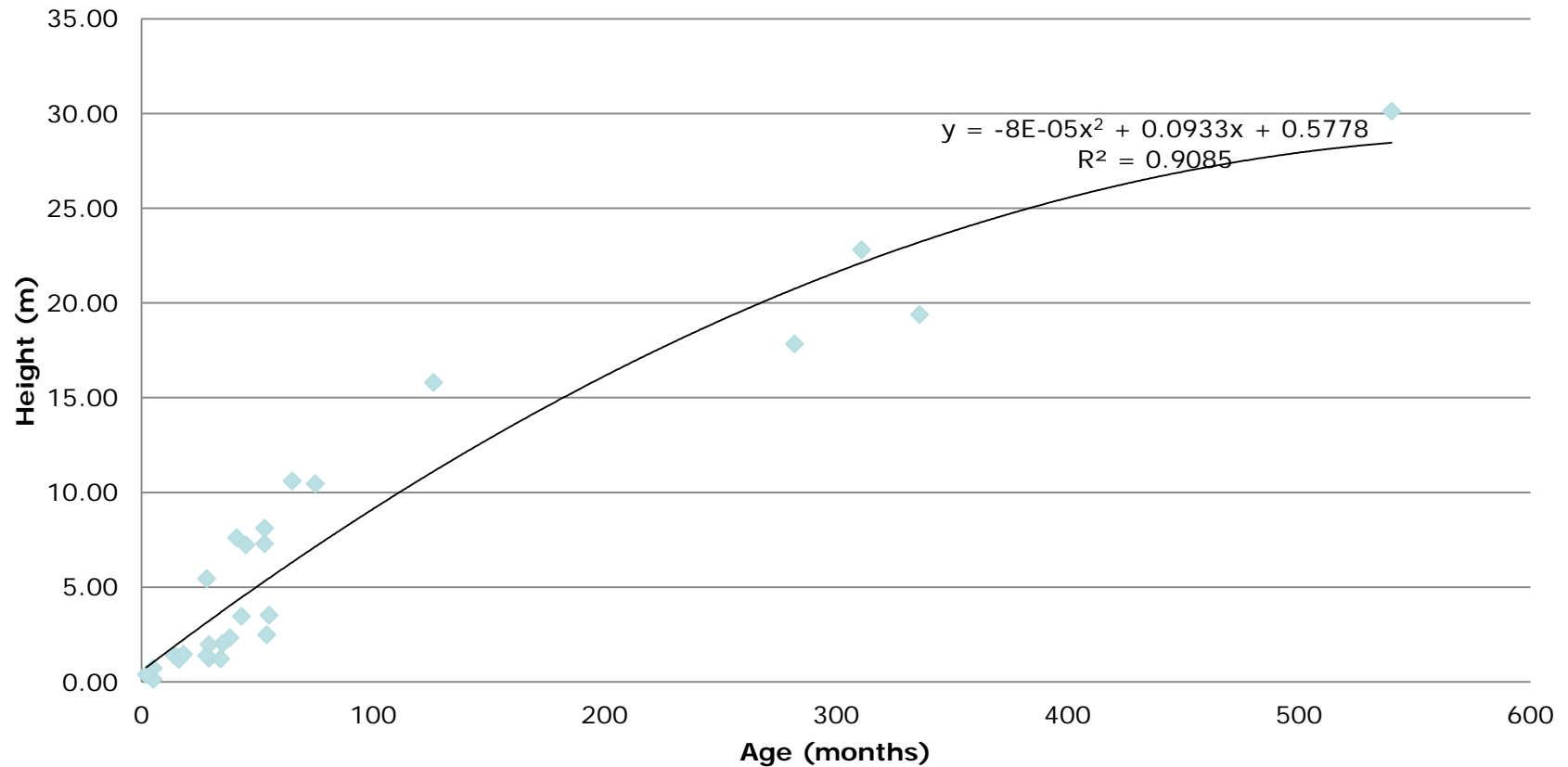
Or 24.2 odt
ha⁻¹ y⁻¹

E. gunnii growth

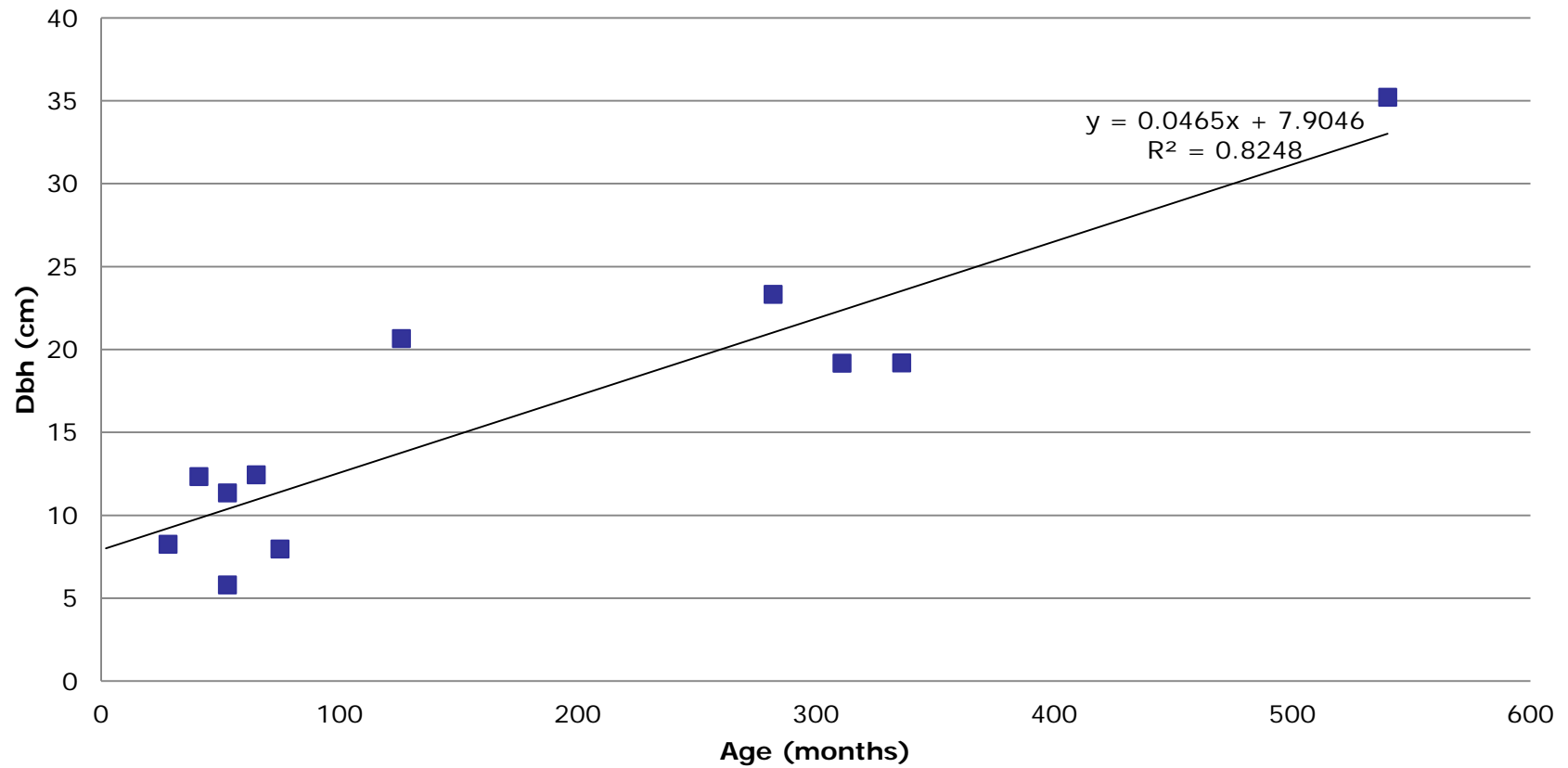


- 1st rotation: 15 years – 26 m³ ha⁻¹ y⁻¹
based on interpolated data from sites from
across GB
- 2nd rotation: 10 years - Red Marley – MAI
Coppice = 30 m³ ha⁻¹ y⁻¹ @ 10 years old

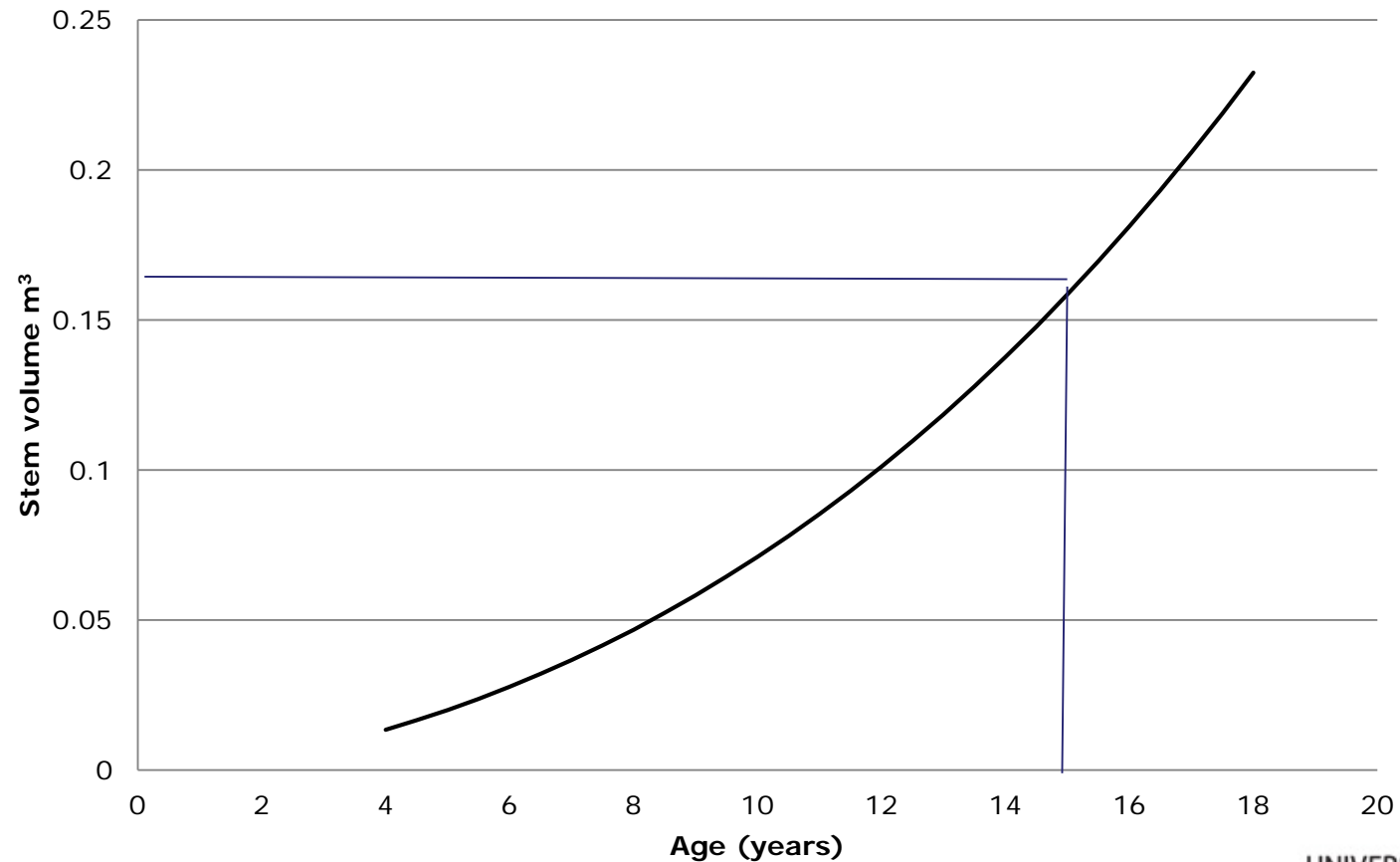
E. gunnii growth



E. gunnii growth



E. gunnii growth



E. gunnii growth



Dbh @ 15 years = 16.3 cm

Height @ 15 years = 17.4 m

AFOCEL (2003) volume equation:

Stem volume =

$$-5.04 + (0.03556 * (dbh^2) * height)) / 1000$$

Tree volume @ 15 years = 0.16 m³

Income – 1st Rotation



- Stem volume @ 15 years = 0.16 m^3
- Standing volume @ 2,500 stems/ha = $396 \text{ m}^3 \text{ ha}^{-1}$
- MAI = $26 \text{ m}^3 \text{ ha}^{-1} \text{ y}^{-1}$
- Standing sales prices for material of stem volume of 0.16 m^3 for GB is approx $\text{£}11 \text{ m}^{-3}$ ($\text{\$}5 \text{ ft}^{-3}$)
- So standing value = $\text{£}4365 \text{ ha}^{-1}$ ($\text{\$}2587 \text{ acre}^{-1}$)
- Delivered biomass prices for the UK electricity sector are $\text{£}30\text{-}60 \text{ odt}^{-1}$ (ex VAT) for UK feedstocks and a price range of $\text{£}105\text{-}135 \text{ odt}^{-1}$ for imports (DECC 2010)

Income – subsequent rotations



- Coppice volume @ 10 years = 300 m^3
- MAI = $30 \text{ m}^3 \text{ ha}^{-1} \text{ y}^{-1}$
- $300 \text{ m}^3 @ 1.05 \text{ t m}^{-3} = 315 \text{ tonnes wet weight or } 150 \text{ tonnes dry weight (based on AFOCEL 2003)}$
- Standing sales prices for material of stem volume of less than 0.124 m^3 for GB is approx $\text{£}11 \text{ m}^{-3}$ ($\text{\$}5 \text{ ft}^{-3}$)
- So standing value = $\text{£}3,300 \text{ ha}^{-1}$ ($\text{\$}2,138 \text{ acre}^{-1}$)
- In 55 years get 5 rotations

Establishment costs

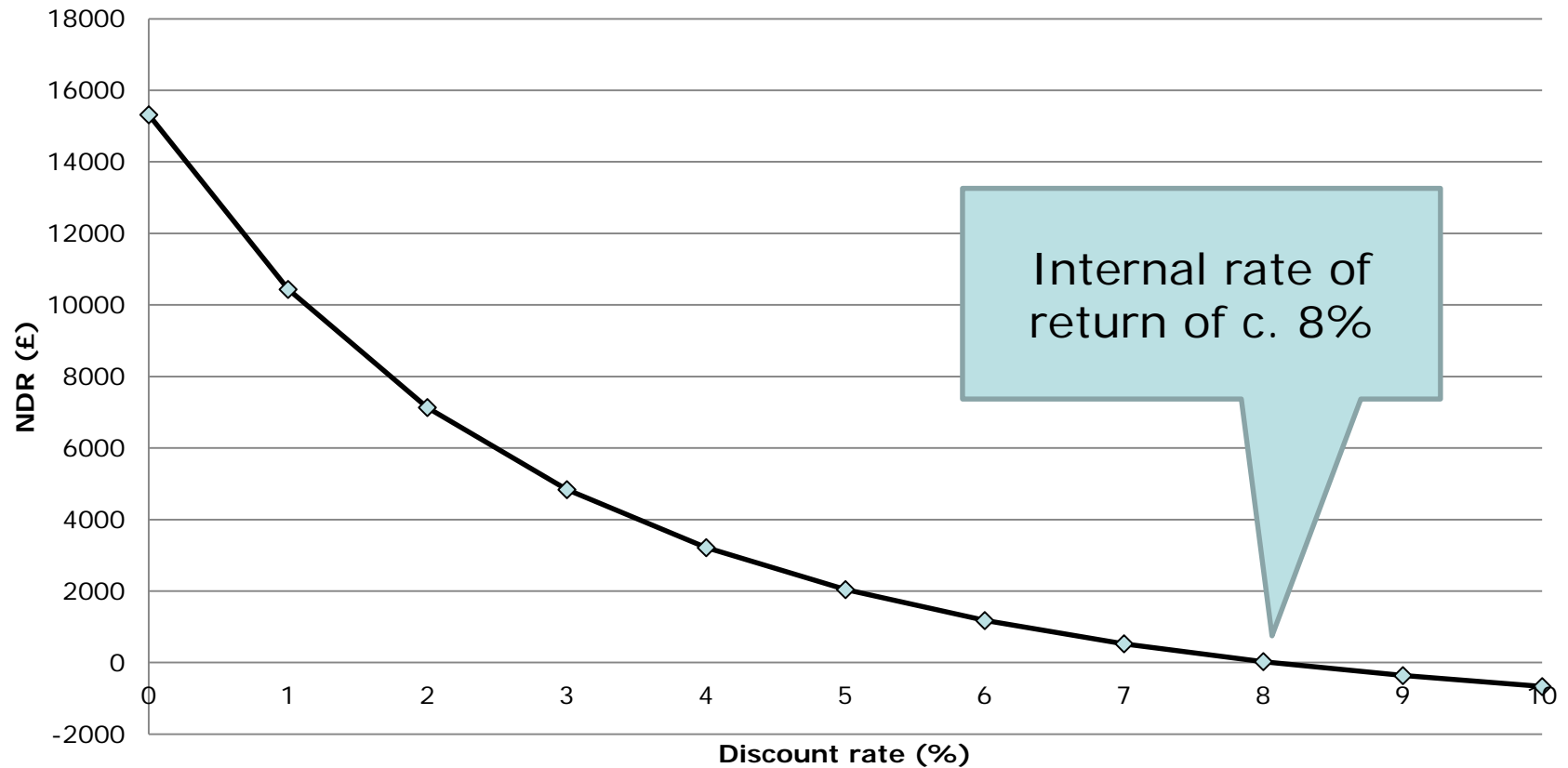


NDR @ 5% discount rate



Year	Operation	Cost/ Revenue (£)	Disc Cost/ Revenue (£)
0	Establishment	-1850	-1850
1	Herbicide	-200	-191
2	Herbicide	-200	-181
15	Harvesting single stems	+4365	+2100
25	Harvesting coppice	+3300	+975
35	Harvesting coppice	+3300	+598
45	Harvesting coppice	+3300	+367
55	Harvesting coppice	+3300	+225
	TOTAL	+15315	+2043

NDR & IRR



Comparison alternative

Sitka Spruce, YC20, 2500 stems ha⁻¹, intermediate thin



Year	Operation	Cost/ Revenue (£)	Disc Cost/ Revenue (£)
0	Establishment	-1850	-1850
1	Herbicide	-200	-191
2	Herbicide	-200	-181
20	Thinning	+287	+108
25	Thinning	+559	+165
30	Thinning	+1102	+255
35	Thinning	+1055	+191
40	Thinning	+739	+105
45	Thinning	+1129	+126
50	Thinning	+959	+84
55	Clear fell	+9125	+754
	TOTAL	+12705	-434

Risk



Minimum Temperature Monthly Lowest [deg C] January 1961-90

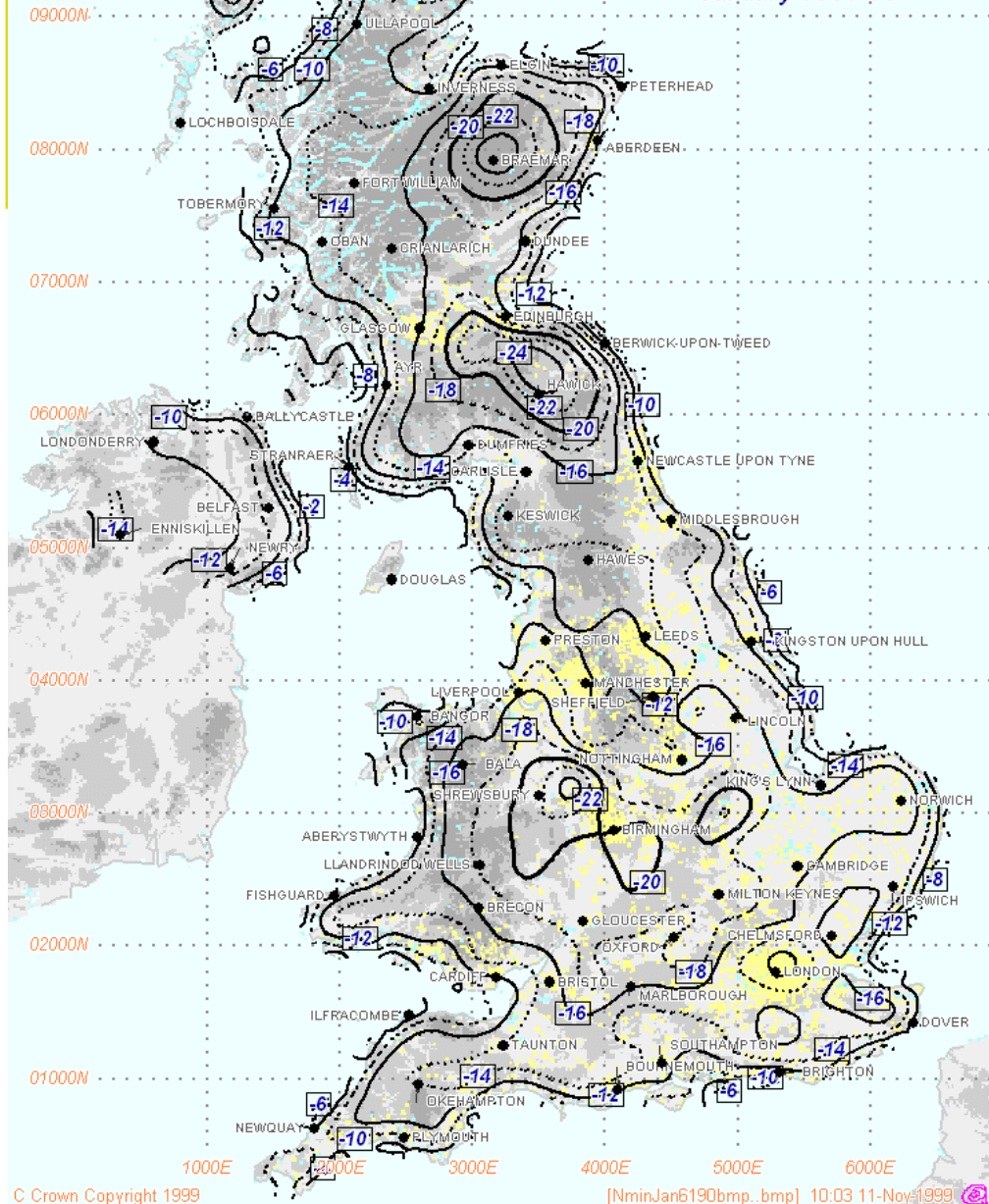


Figure 3: Minimum temperature for January (1961-1990). (Met Office undated)

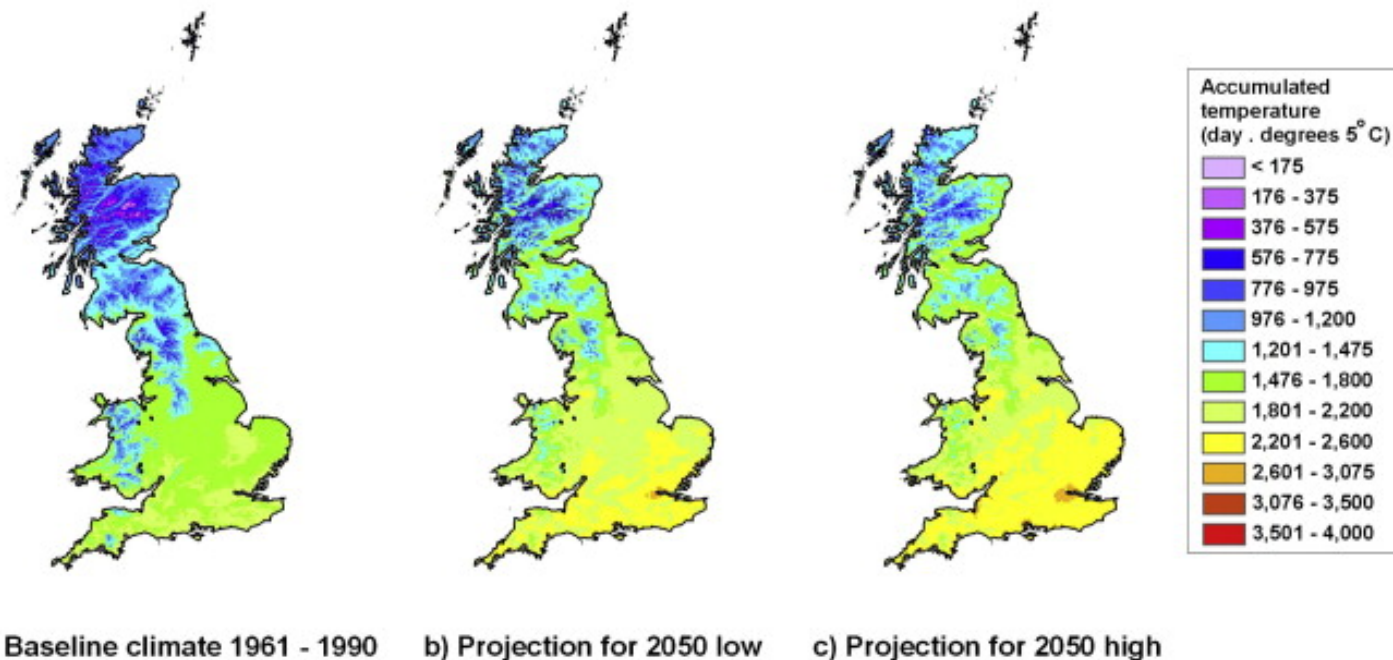
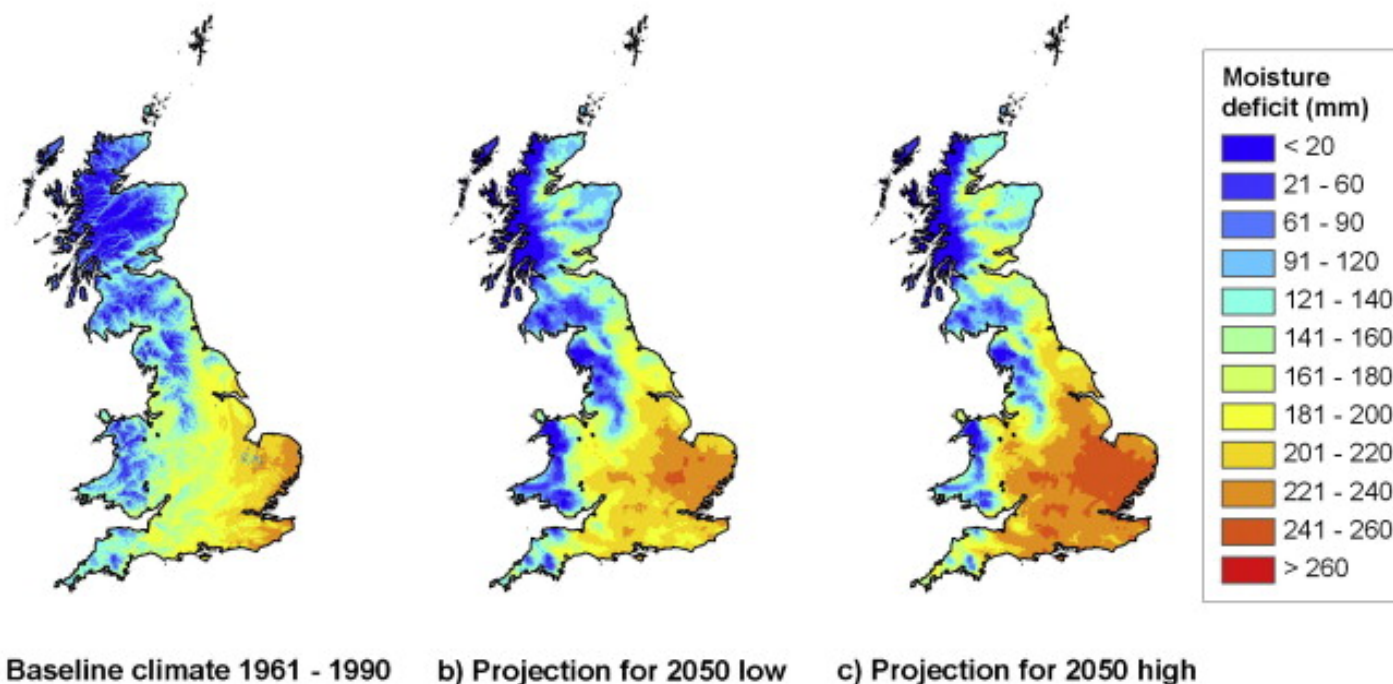


Figure 4:
Projections for
Accumulated
Temperature and
Moisture Deficit
for Great Britain
(Broadmeadow,
Webber, Ray
and Berry 2009)



Conclusions



- Cold tolerant eucalypts possible crop
- Highly productive
- Higher returns than other trees
- But...Risk of cold damage
- Future risk not predictable

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